

**THREE NEW SPECIES OF *GEKKO*  
AND REMARKS ON *GEKKO HOKOUENSIS*  
(LACERTIFORMES, GEKKONIDAE)**

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TRANSLATORS' NOTES

In preparing the English version from the original (in Chinese, with English summary), we attempted to make as literal a translation as possible. However, a few minor changes were made with footnotes (\* - \*\*\*\*); these footnotes follow the references. Locality names were written in Continental spellings, followed by Taiwanese spellings in parentheses at their first appearance.

We thank R.I. Crombie and G.R. Zug for their assistance and encouragement during the process of preparation of the present manuscript.

## INTRODUCTION

Among the gekkonid genera occurring in China, *Gekko* is the largest group with the widest range of distribution. Six species and two subspecies have hitherto been known for the genus from China (Stejneger, 1932; Chen, 1969). During 1975 to 1980, Department of Biology, Nanjing Normal College collected 1637 specimens of *Gekko* from Hebei (Hopei), Shanxi (Shansi), Shaanxi (Shensi), Shandong (Shantung), Henan (Honan), Jiangsu (Kiangsu), Anhui (Anhwei), Hubei (Hupeh), Sichuan (Szuchuan), Zhejiang (Chekiang), Fujian (Fukien), Jiangxi (Kiangsi), Hunan (Hunan), Guizhou (Kweichow), Yunnan (Yunnan), Guangdong (Canton), Hainan (Hainan)\*, and Guangxi (Kwangsi) Provinces. Several specimens were also collected from Guizhou Province by Department of Biology, Zunyi Medical College. While studying these specimens, three new species were discovered. On the other hand, *Gekko japonicus hokouensis* from Yanshan (Chainshan) Prefecture, Jiangxi Province, proved to represent a good species. Consequently, ten *Gekko* species\*\* are presently recognized from China as follows:

### Key to species of *Gekko* in China

1. Rostral separated from nostril ..... 2  
Rostral in contact with nostril ..... 3
2. Body relatively large, longer than 200 mm in total length; tubercles not particularly concentrated in upper margin of ear opening ..... *G. gekko*  
Body relatively small, shorter than 150 mm in total length; upper margin of ear opening with cluster of enlarged conical tubercles concentrated in high density .... *G. auriverrucosus* sp. nov.
3. Male with 24 femoral pores in each side ..... *G. kikuchii*  
Male with preanal, or preanal-femoral pores ..... 4
4. A single enlarged spur on each side of base of tail ..... 5  
Enlarged spurs, two to three, with slight variation, on each side of base of tail ..... 8
5. Webs between digits evident ..... 6  
Webs between digits very slight or absent ..... 7
6. Tubercles absent on dorsum of body; male with 7-11 preanal pores ..... *G. subpalmatus*  
Tubercles present on dorsum of body; male with 17-27 preanal pores ..... *G. chinensis*
7. Supranasals in contact; dorsal tubercles flat; head and body length reaching 80 mm .....  
..... *G. liboensis* sp. nov.  
Supranasals separated by a small scale; dorsal tubercles relatively convex; head and body length not greater than 70 mm ..... *G. hokouensis*
8. Granular scales on dorsum of body relatively large; dorsal tubercles flat, in low density .....  
..... *G. swinhonis*  
Granular scales on dorsum of body relatively small; dorsal tubercles relatively convex, in high density ..... 9
9. Dorsal surfaces of body, thigh, and shank with much enlarged tubercles .....  
..... *G. scabridus* sp. nov.  
Tubercles moderately enlarged in dorsal surfaces of body and shank, usually lacking in thigh...  
..... *G. japonicus*

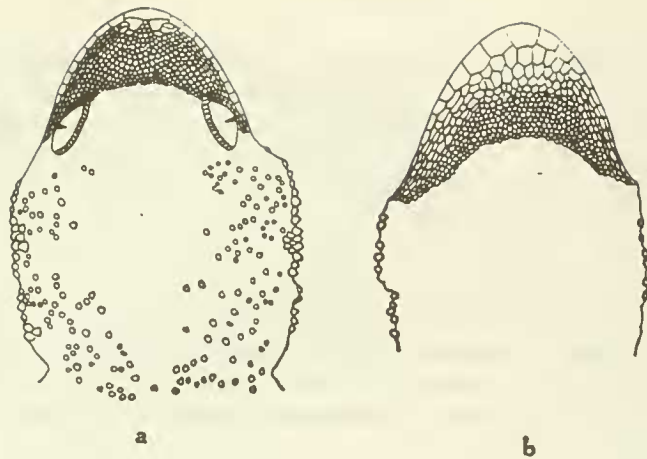


Fig. 1. *Gekko auriverrucosus* sp. nov. a. Dorsal view of head; b. Ventral view of head.

***Gekko auriverrucosus* Zhou et Liu sp. nov. (Plate I: 2, Fig. 1)**

Holotype—Male (NNC 80275), collected from Hejin (Hojin) Prefecture, Shanxi Province (alt. 459 m), on 19 August 1980. Allotype: female (NNC 80243), collection date and locality as for holotype. Paratypes: 33 males and 41 females, collected from Hejin, Yongji (Engtsi), and Linyi (Linyi) Prefecture, Shanxi Province. Collector: Xin-rong Xu. Type specimens are deposited in Department of Biology, Nanjing Normal University.

Diagnosis—Rostral separated from nostril; upper margin of ear opening with cluster of enlarged conical tubercles gathering in high density; tubercles uniformly scattered in temporal and occipital regions, neck, and dorsal surfaces of body, base of tail and limbs; male with 8-11 preanal pores.

Description—Snout about twice as long as eye diameter, distinctly longer than distance between eye and ear opening; diameter of ear opening 0.9-1.5 mm, about 30-44% of eye diameter; rostral twice as broad as high, angulated at midpoint dorsally, separated from nostril; nostril surrounded by first supralabial, supranasal, and two small scales; supranasals moderately enlarged, slightly longer than broad, separated from each other by a minute scale, or in contact with each other medially; supralabials 9-11; infralabials 9-11; mental pentagonal; chin shields forming several rows of transverse arches; first row normally comprising five shields, each slightly longer than broad, median three largest; scales following chin shields and reaching gular region uniform, granular (Fig. 1).

About 12 scales between nostril and eye; interorbital scales about 25; upper margin of ear opening with tubercle cluster comprising about six enlarged conical tubercles gathering in high density; around jaw angle and preotic region also with enlarged conical tubercles; tubercles uniformly scattered among dorsal granular scales, from temporal and occipital regions to base of tail, in 16-20 irregular rows at midbody; dorsal surfaces of forelimbs covered with small tubercles; on dorsal surfaces of hindlimbs, tubercles scattered among granular scales; scales granular in gular region, imbricate in the other part of ventral surface of body; webs between digits rudimentary; underneath dilated portions of toes with lamellae, 6-8 on toe I, 6-8 on toe II, 6-8 on toe III, 6-8 on toes IV, and 7-9 on toe V; male with 8-11, mostly 8-9 preanal pores.

Table 1. Measurements (in mm) of specimens of *Gekko auriverrucosus*.

Specimens	Total length	Eye diameter	Diameter of ear opening	Snout length	Head length	Axilla groin length	Fore-limb length	Hind-limb length
<b>Holotype</b> (NNC 80275)	125.5 (62+63.5)	3.2	1.2	6.7	15	28	18.5	24.5
<b>Allotype</b> (NNC 80243)	135.5 (65.5+70)	3.3	1.3	7.3	16	30.5	19	27
<b>Paratypes</b>								
11 males from Hejin	119 (59+60)- 130 (63+67)	3- 3.5	1- 1.3	6.3- 7	14- 16	25- 29.5	16- 19	24- 25
16 females from Hejin	117 (56+61)- 133 (65+68)***	3- 3.6	1- 1.5	6.4- 7.5	14- 17	27- 33	16.5- 20	23- 28.5

Tail slightly compressed, with two or three enlarged spurs in each side at base; dorsum of tail covered with tubercles of various sizes; annular grooves in about every sixth to eighth tubercle; venter of tail with a longitudinal row of laterally elongated shields.

Dorsal ground color of preserved specimen pale gray; a brown bar from nostril through eye and ear to shoulder; top of head with brown markings; dorsal surfaces of neck and body with 5-6 transverse brown bands; dorsum of tail with 9-13 transverse brown bands; posterior edge of transverse bands in body and tail darkly edged; dorsal surfaces of four limbs also with transverse brown bands; venter of body light reddish yellow.

This new species might be easily misidentified as *G. japonicus*. However, the latter species has a rostral entering the nostril, and lacks a cluster of tubercles in the upper margin of the ear opening. Thus, *G. japonicus* is actually distinct from the present new species.

In the natural habitat, the density of *G. auriverrucosus* is very high. It prefers to perch on high portions of walls, and occasionally appears on artificially lighted areas to search for prey. In June and July, the present species has its reproductive season. Juveniles collected between 19 and 22 August had already reached 31-32.5 mm in head and body length. All adult females collected on the same date from the same locality with the above juveniles possessed no mature eggs. About 1/6 of the total sample had parasitic mites, especially in high density on digits.

***Gekko liboensis* Zhou et Li sp. nov.** (Plate II: 1, Fig. 2)

Holotype—Female (TMC 791669), Chengguan (Chengkwan), Libo (Libo) Prefecture, Guizhou Province (alt. 430 m), on 5 July 1979, by Zhi-lu Zhao. This specimen is deposited in Department of Biology, Zunyi Medical College.

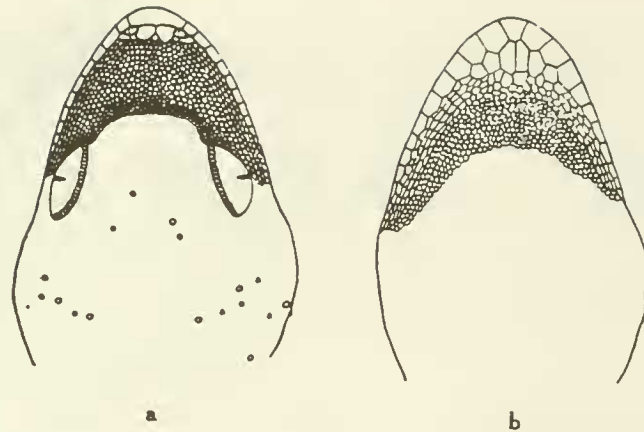


Fig. 2. *Gekko liboensis* sp. nov. a Dorsal view of head; b. Ventral view of head.

**Diagnosis**—Head and body length exceeding 80 mm; supranasals large, in contact with each other medially; flat, cycloid tubercles among dorsal granular scales, forming about 10 irregular longitudinal rows; webs evident between fingers I, II and III, very slight between fingers III, IV and V.

**Description**—Holotype very large, head and body length nearly 85 mm; snout 1.8 times as long as eye diameter, distinctly longer than distance between eye and ear opening; diameter of ear opening 2 mm, about 40% of eye diameter; rostral broader than deep, upper margin slightly concaved at midpoint; nostril surrounded by rostral, first supralabial, supranasal, and two small scales; supranasals large, in contact with each other medially; supralabials 12; infralabials 11; mental triangular; median pair of chin shields twice as long as broad, posteriorly entered by a pair of small polygonal chin shields (Fig. 2).

About 18 scales between nostril and eye; interorbital scales about 40; flat, cycloid tubercles uniformly scattered in low density on dorsum, from parietal and occipital regions to base of tail, forming about 10 irregular rows on body; fore- and hindlimbs without tubercles; ventral surface posterior to neck covered with imbricate scales; 10 enlarged scales in preanal region.

Underneath dilated portions of fingers covered with lamellae, eight on finger I, eight on finger II, nine on finger III, nine on finger IV, and eight or nine on finger V; rudimentary webs evident

Table 2. Measurements (in mm) of a specimen of *Gekko liboensis*.

Specimens	Total length	Eye diameter	Diameter of ear opening	Snout length	Head length	Axilla groin length	Fore-limb length	Hind-limb length
<b>Holotype</b> (TMC 791669) (regenerated tail)	121.8 (84.8+37)	5	2	9.2	21	37	25.2	35

between fingers I, II and III, faintly between fingers III, IV and V; margins of webs attaching to proximal one third of toes; hindlimb much developed, its length 95% of axilla to groin length; underneath dilated portions of toes covered with lamellae, eight on toe I, seven or eight on toe II, eight on toe III, nine on toe IV, and nine on toe V; rudimentary webs evident between toes I, II, III and IV; a single large spur on each side of base of tail; tail regenerated, very short.

Dorsal ground color in preservative grayish tan; a brown bar running along lower margin of eye, almost reaching to ear opening posteriorly; dorsal surfaces of neck and body with nine transverse brown bands; dorsal surfaces of limbs also with transverse brown bands; venter of body pale reddish yellow.

This new species greatly resembles *G. hokouensis*. However, the latter has supranasals separated from each other, and conical dorsal tubercles. Moreover, the head and body length of *G. hokouensis* is shorter than 70 mm.

*G. liboensis* is rarely observed at Chengguan, Libo Prefecture.

### *Gekko hokouensis* Pope

*Gekko japonicus hokouensis* Pope, 1928, Amer. Mus. Novitates 325: 1-2 (Yanshan Prefecture, Jiangxi Province)

Pope (1928) regarded this form as a subspecies of *G. japonicus*, and stated that *G. j. hokouensis* differs from the nominal subspecies only in the number of cloacal spurs; he noted that the former has a single spur on each side of the base of tail, whereas the latter has two or three spurs. While investigating a large series of specimens, we found that *hokouensis* has a relatively large spur, measuring about 2.2-3.1 mm for the male and 1.3-2.0 mm for the female in maximum diameter. Although the spur is more or less grooved and incompletely divided in a few males and most females, the outline of the single spur remains apparent in all animals (Plate II: 4-9). On the other hand, *japonicus* possesses two or three smaller spurs below three larger spurs. The size of each spur is relatively small, and the maximum diameter of the largest spur measured 1.2-1.5 mm in the male and 0.6-1.0 mm in the female (Plate II:10-11). Differences are recognizable between *hokouensis* and *japonicus* also in the condition of dorsal tubercles as follows. In *hokouensis*, tubercles are absent on the four limbs, and relatively few around the middle of the body. On the other hand, in *japonicus*, the dorsal surface of the forearm and shank is covered with tubercles, and the tubercles around the middle of the body are in relatively high density (Plate II:2-3, Table 3).

Table 3. Comparison of dorsal tubercles in *Gekko hokouensis* and *G. japonicus*.

Species	N	Localities	Occipital and neck	Body	Upper arm	Forearm	Thigh	Shank
<i>Gekko hokouensis</i>	271	17 locations in six provinces	- / +	+	-	-	-	-
<i>Gekko japonicus</i>	747	50 locations in 12 provinces	+	++	-	+	- / +	+

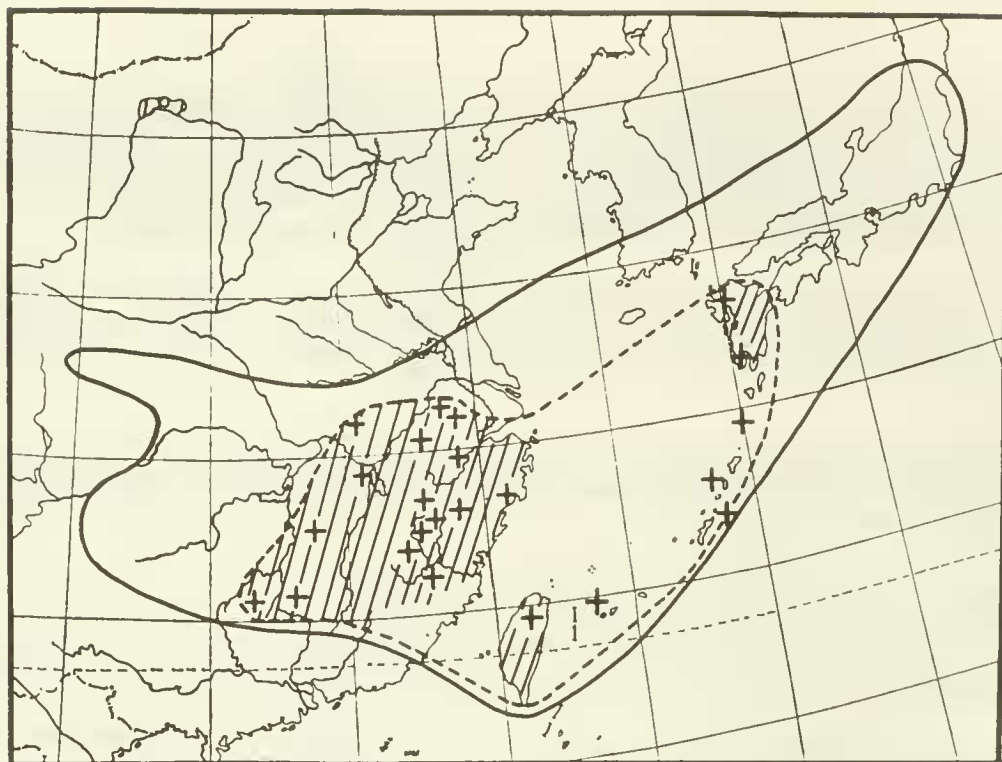


Fig. 3. Distributions of *Gekko hokouensis* and *Gekko japonicus*. Ranges of the former and the latter are outlined by broken and complete lines, respectively. Cross-marks indicate localities of specimens of *G. hokouensis* cited in the present study\*\*\*\*.

On the basis of the above characteristics, we identified 271 specimens out of 1018 of *G. japonicus* (sensu lato) as *hokouensis*, and the remaining 747 as *japonicus* (sensu stricto). The former specimens were collected from 17 prefectures of six provinces, and the latter from 50 prefectures or cities of 12 provinces. The sampling localities of *hokouensis* are scattered within the range of *japonicus* (Fig. 3).

Conditions of natural habitats also differ between these two gekkonids; while *hokouensis* has its habitat in montane environments, *japonicus* is widely distributed in cities and villages of the plain regions. In Jiujiang (Kiukiang) City, for example, *japonicus* is found in urban area, whereas *hokouensis* in Lushan-haihui (Lushan-haihui), Bailudong (Bailudong) and Guling (Kuling). In Yixing (Ising) Prefecture, *japonicus* and *hokouensis* occur in the lowland and montane areas, respectively. The mutual displacement between *hokouensis* (a mountain dwelling species) and *japonicus* (a plain dwelling species) around a sympatric area much resembles the displacement between *Eremias brenchleyii* and *E. argus*. However, there are some areas where both of these gekkonids are collected from the same point at the same time. For example, of the 25 specimens obtained within a city of Chong'an (Chungan) Prefecture, on 26-27 June 1978, 15 specimens were identified as *japonicus* and the remainder as *hokouensis*. No intermediate forms were found among the above specimens.

Based on the morphological distinctiveness, sympatric occurrence, and ecological differences, we remove *hokouensis* from the subspecific status of *G. japonicus*, and regard it as a distinct species *Gekko hokouensis* Pope.



Within China, *G. hokouensis* is distributed in Yixing and Lishui (Lishui), Jiangsu Province, Tonglu (Tonglu) (Stejneger, 1932), Longquan (Longchuan), Beiyandangshan (Beiyantangshan), Zhejiang Province, Pucheng (Pucheng), Chong'an, Wuyishan (Wuyishan), Shaowu (Shaowu), Youxi (Yousi), Fujian Province, Taiwan Province (Maki, 1923), Jinzhai (Ginshai; Xuzhou Normal University), Huangshan (Huangshan) and Taiping (Taiping; Chengdu Institute of Biology), Anhui Province, Yanshan, Ninggang (Ningkwang), Lushan, Jiangxi Province, Yizhang (Ichang; Zhengdu Institute of Biology), and Jiangyong (Kiangyong)<sup>1</sup>, Hunan Province. In Taiwan, *G. japonicus* has been reported from several localities (Chen, 1969). Maki (1923) described specimens of "*G. japonicus*" from Taiwan as possessing a single process in each side of the base of tail, and limbs covered only with granular scales. These characteristics are identical with those of *G. hokouensis*. Of the specimens of "*G. japonicus*" collected from Japan, some animals such as the one from Nagasaki (USNM 13563; Stejneger, 1907) were reported to have three spurs in each side at the base of the tail, and tubercles on the dorsum of the shank, whereas others such as specimens from Yamagawa (USNM 31821 and 31822; Stejneger, 1907) and Fukuoka (Okada, 1936: fig. 1) possess a single spur and lack tubercles on limbs. Nakamura and Uéno (1963) noted that *G. japonicus* has normally a single but occasionally two or three tubercles, and that some animals possess tubercles on limbs. In October 1981, one of us examined specimens under the care of Dr. Shun-Ichi Uéno at National Science Museum, Tokyo. Of the 21 specimens there, 12 from Tokara Is. (0231, 02287, 02293-95), Tokunoshima I. (0924), Yoronjima I. (0524, 02288-90, 02292) and Iriomotejima I. (0475) were identified as *G. hokouensis*, and the other nine from Tokyo (0236, 02286, 02297-98), Kyoto (02302) and Tsushima I. (0038, 0851, 0853, 02296) as *G. japonicus*. These results indicate that "*G. japonicus*" in Japan actually includes both *G. hokouensis* and *G. japonicus* (*sensu stricto*).

*Gekko scabridus* Liu et Zhou sp. nov. (Plate I: 1, Fig. 4)

*Gekko* sp. Hu Shu-chin, Djao Er-mie and Liu Cheng-chao, 1973, Acta Zoologica Sinica 19(2): 155, from Guiyang (Kweiyang)

Holotype—Male (NNC 80122), Yongren (Yongzen) Prefecture, Yunnan Province (alt. 1531 m), on 4 Aug. 1980. Allotype: female (NNC 80143), collection date and locality as for holotype. Paratypes: 16 males and 33 females collected from Yongren Prefecture, Yunnan Province, and Miyi (Miyi) Prefecture, Sichuan Province. Collector: Xin-rong Xu. Type specimens are deposited in Department of Biology, Nanjing Normal University.

Diagnosis—Tubercles covering dorsal surfaces of body and hindlimbs much enlarged; male with 10-15 preanal pores.

Description—Eye relatively large, its diameter longer than half, as long as 51.4-57.1%, of snout length; snout slightly longer than distance between eye and ear opening; diameter of ear opening 0.9-1.5 mm, about 23-41% of eye diameter; rostral rectangular, its breadth less than twice of height; in a few specimens, upper margin of rostral slightly concave dorsally at mid point; nostril surrounded by rostral, first supralabial, supranasal, and two small scales; supranasals moderately enlarged, slightly broader than long, separated from each other normally by a single scale, but in

<sup>1</sup> All the locality data without citations of authors or institution are based on the specimens deposited in Department of Biology, Nanjin Normal College.

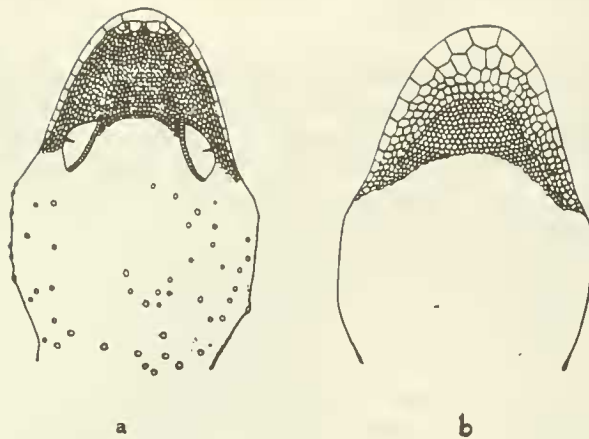


Fig. 4. *Gekko scabridus* sp. nov. a. Dorsal view of head; b. Ventral view of head.

some specimens, by two scales, or in contact with each other medially; supralabials 9-11; infralabials 9-11; mental pentagonal; chin shields longer than broad, median pair largest, outer pair relatively small, continuously graded to small granules through three to four rows of small hexagonal scales (Fig. 4). About 12 scales between nostril and eye; interorbital scales about 30; tubercles scattered among dorsal granular scales in high density, from frontal, parietal, temporal and occipital regions of head to base of tail, in 17-21 irregular rows around middle of body, those on dorsum of body extremely enlarged; limbs covered with granular scales dorsally, tubercles present on limbs except for upper arms; tubercles on hindlimbs distinctly enlarged like those in dorsum of body; venter of body covered with imbricate scales; interdigital webbings rudimentary; underneath dilated portions of digits with lamellae, 6-9 on toe I, 6-9 on toe II, 7-9 on toe III, 7-9 on toe IV, and 7-10 on toe V; male with 10-15, mostly 12 or 13, preanal pores.

Tail slightly compressed, with two or three enlarged spurs on each side at base; only one specimen (NNC 80166) of 51 examined had a single enlarged spur on both sides; dorsum of tail covered with granular scales; annular grooves in about every seventh to ninth row of granules; grooves in proximal one third of tail margined by six to eight enlarged tubercles posteriorly, such tubercles gradually disappearing in remaining portion of tail; venter of tail covered with imbricate scales, median scales enlarged and irregularly arranged, paired or not paired, in distal two-thirds to four-fifths of tail.

Dorsal ground color of preserved specimen pale brown; two brown bars from nostril through eye to temporal region; dorsal surfaces of head, body and limbs with irregular brown spots and reticulations; 7-9 transverse bars on neck and body; dorsum of tail with 10-14 transverse brown bars; venter of body light reddish yellow.

*G. scabridus* closely resembles *G. japonicus*. However, these species differ from each other as follows. In *G. japonicus*, dorsal tubercles on the body and shanks are distinctly smaller than those in *G. scabridus*, and tubercles are normally lacking on thighs. Moreover, male *G. japonicus* normally has only 4-8 preanal pores.

In the natural habitat, *G. scabridus* occurs in very high densities, and is observed equally in lighted and dark areas of walls. Of the specimens examined, a few animals possessed parasitic

Table 4. Measurements (in mm) of specimens of *Gekko scabridus*.

Specimens	Total length	Eye diameter	Diameter of ear opening	Snout length	Head length	Axilla groin length	Fore-limb length	Hind-limb length
<b>Holotype</b> (NNC 80122)	112.5 (57.5+55)	3.7	1.3	7	15.7	26	17.5	26
<b>Allotype</b> (NNC 80143)	120.5 (58+62.5)	3.8	1.4	7	15.7	27	19	24.5
<b>Paratypes</b>								
11 males	114 (57+57)-	3.7-	1.2-	7-	15.4-	25.5-	17.5-	25-
Yongren	138 (64+74)	4.2	1.5	7.5	17	30	20	27
12 females	116.5 (56.5+60)-	3.5-	1.1-	6.3-	14.5-	25-	16.5-	24-
Yongren	140.5 (63.5+77)	4	1.5	7.3	17	30	19	27

mites. Juveniles collected in the beginning of August had reached 28-33 mm in head and body length. All adult females collected in the same date from the same locality with the above juveniles had no mature follicles.

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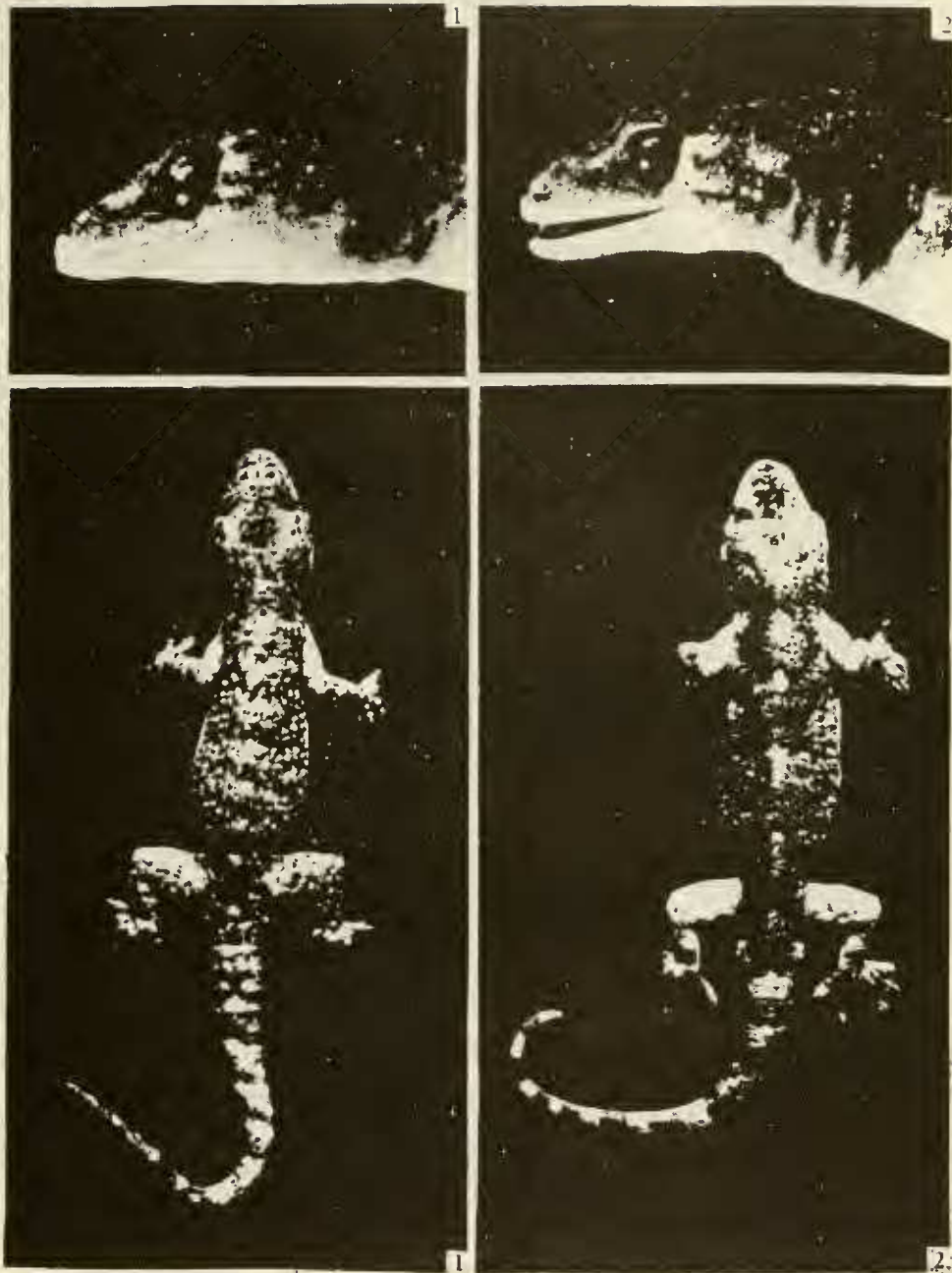
## TRANSLATORS' FOOTNOTES

\* In the original, Hainan Island was included in Guandong Province. However, this island was removed from the latter to form an independent province, Hainan Province, by itself in 1987.

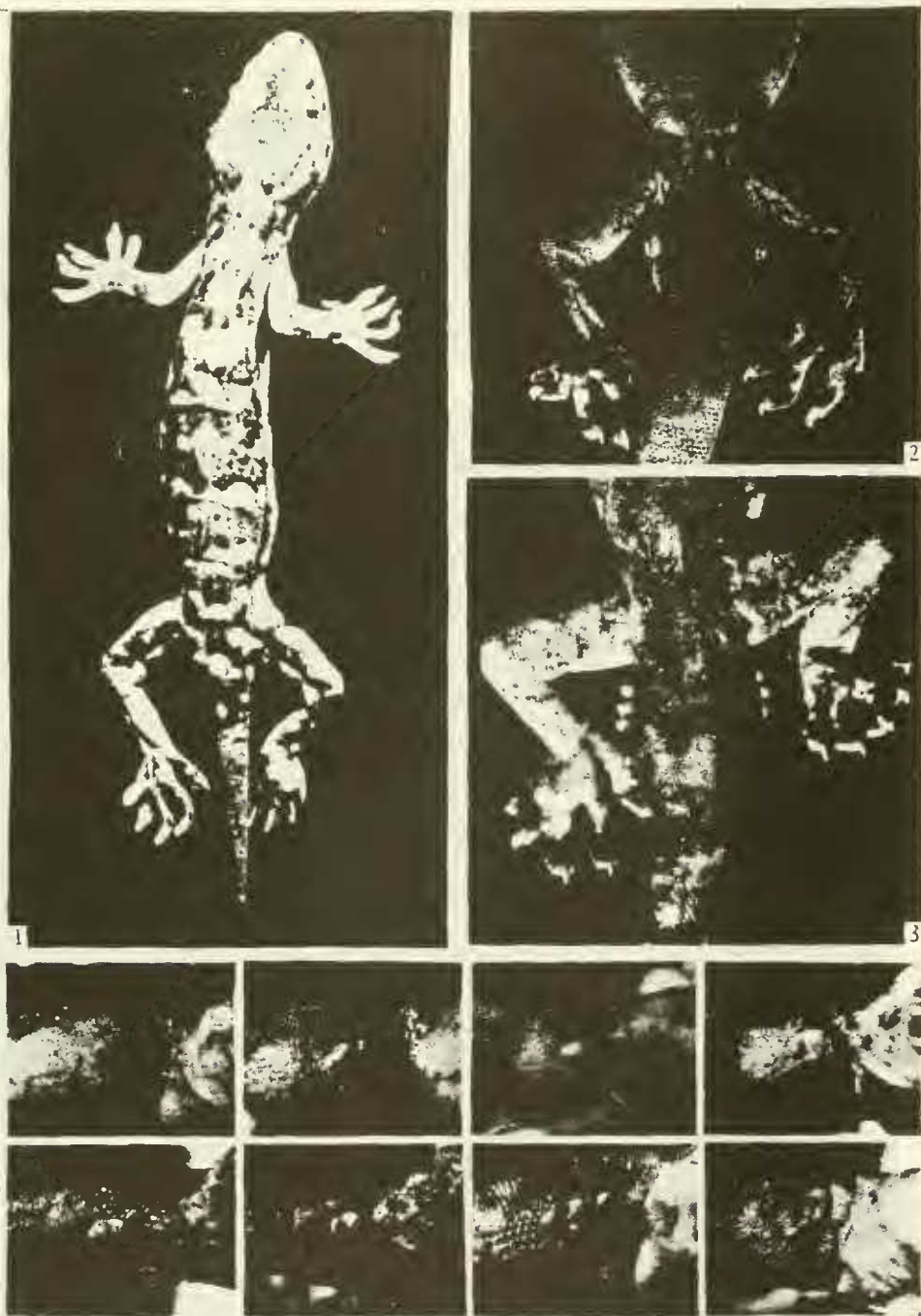
\*\* The original states "10 *Gekko* species and one subspecies", but it lists only 10 species in the key.

\*\*\* Table 1 in the original contains "113 (65+68)", but this must be a typographical error.

\*\*\*\* The figure legend in the original states that the cross-marks in Fig. 3 indicate localities where *G. japonicus* was collected. But it is evident, from the content of the text, that those marks actually represent sampling localities of *G. hokouensis*.



1. *Gekko scabridus* Liu et Zhou, sp. nov. Lateral view of head (above), and dorsal view (below).
2. *Gekko auriverrucosus* Zhou et Liu, sp. nov. Lateral view of head (above), and dorsal view (below).



1. *Gekko liboensis* Zhou et Li, sp. nov. Dorsal view.
2. *Gekko hokouensis*. Dorsal view of base of tail and hind limbs.
3. *Gekko japonicus*. Dorsal view of base of tail and hind limbs.
- 4-9. *Gekko hokouensis*. Enlarged spurs on right side of base of tail in males (4 and 5) and females (6 to 9). Spurs in 4 and 6 have no shallow furrows, whereas those in the remainders (5, 7, 8, and 9) show more or less developed furrows incompletely dividing the spurs.
- 10-11. *Gekko japonicus*. Spurs on right side of base of tail in a male (10) and a female (11).